Occurrence and genesis of alpine linears due to gravitational rock slope deformations in south western British Columbia

Derek Kinakin

Alpine linears are found in many mountainous areas of south western, B.C. The genesis of these features is commonly related to gravitation deformations of rock slopes. Through a combined approach of geomorphological and engineering geological techniques, including field mapping, digital data collection, GIS, and numerical modelling, possible rock slope deformation mechanisms of formation for these alpine linears are explored.

A preliminary stress analysis of selected ridge morphologies through finite difference numerical methods indicates that the resulting stress fields are different for each basic ridge type analysed. These results indicate that various deformation mechanisms may be active in producing alpine linears. An integrated system of digital data collection, GIS and numerical modelling is detailed then applied to a case study of Mount Mercer, B.C. Detailed geomorphic and engineering geological mapping indicates that most of the alpine linears observed along the ridgeline of Mount Mercer can be linked to rock slope deformations caused by mass movements. Based on the Mount Mercer field study, three rock mass deformation mechanisms (toppling, rock slumping, bi-planar) are suggested. Through conceptual numerical modelling based on the geometric and geologic characteristics of Mount Mercer, the potential failure mechanisms are evaluated, using a discrete element methodology, for kinematic plausibility and resulting failure morphologies. The results of the study indicate that toppling is not a suitable rock mass deformation mode for the failures at Mount Mercer, B.C. Bi-planar (active-passive) failure and rock slumping are demonstrated to be suitable for rock slope failures occurring at Mount Mercer and may be applicable to other slopes in South Western, B.C.